Figure 5
Cumulative Returns from December 1990
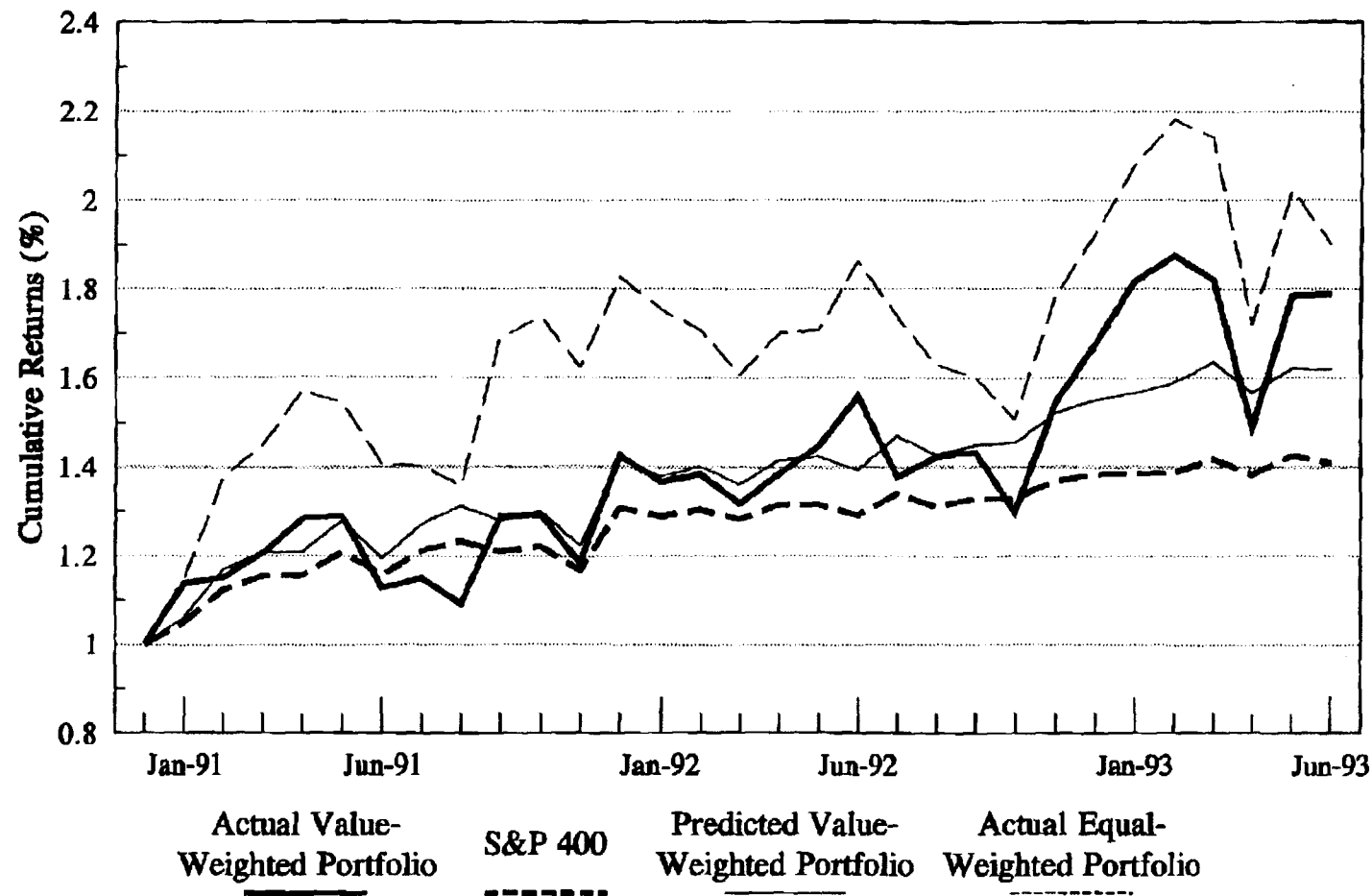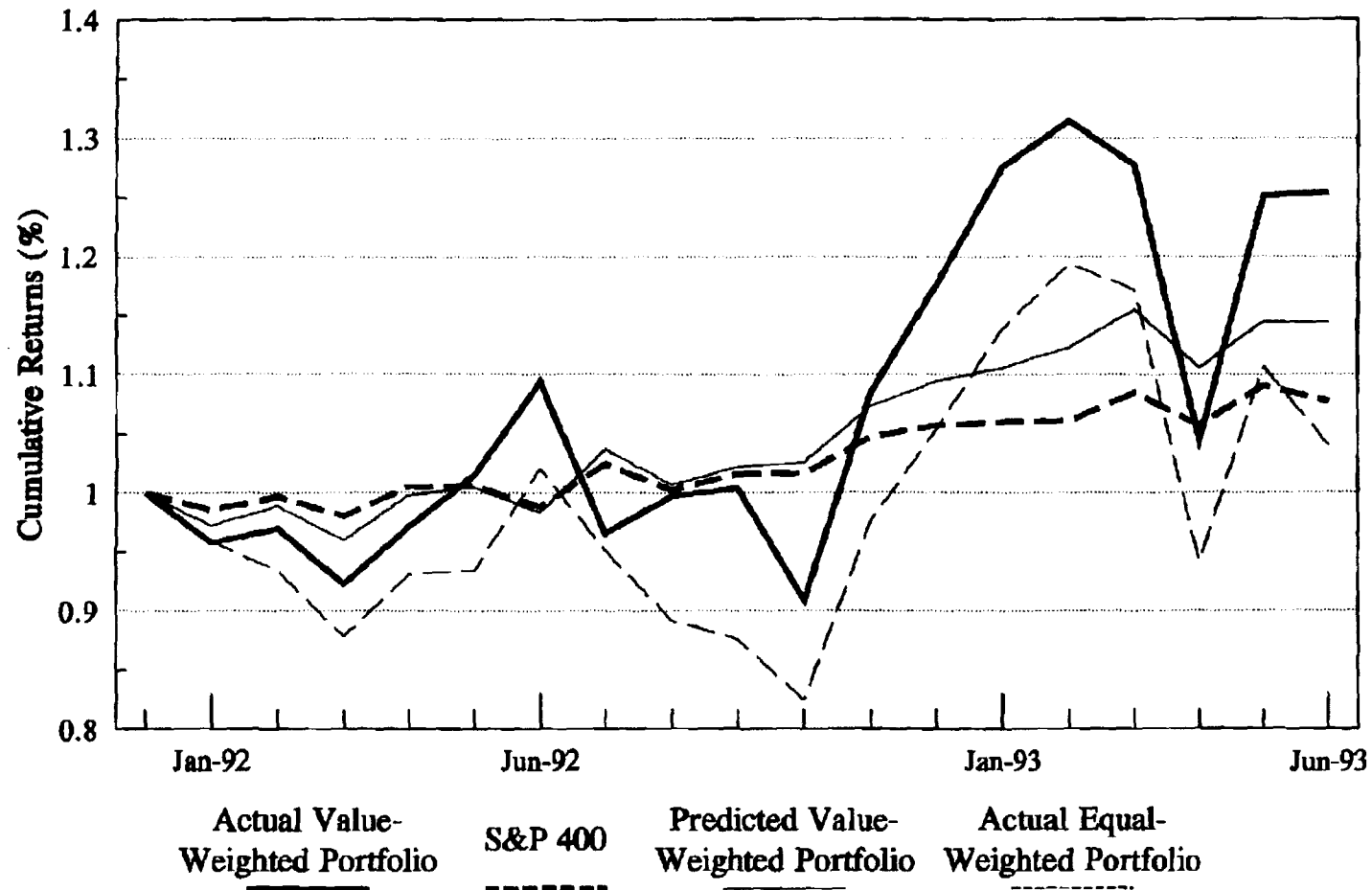

Actual Value-
Weighted Portfolio

S&P 400

Predicted Value-
Weighted Portfolio

Actual Equal-
Weighted Portfolio

Figure 6
Cumulative Returns from December 1991

Actual Value-Weighted Portfolio   S&P 400   Predicted Value-Weighted Portfolio   Actual Equal-Weighted Portfolio

First, as would be expected, the equal-weighted portfolio appears to be more volatile. This implies that the smaller cable companies are riskier.

Second, there are two sharp drops associated with dates that might represent the market's recognition of regulation: the June-October 1992 fall, and the February-April 1993 fall. The former is associated with the passage of the Cable Act of 1992. The latter is associated with this Commission's competitive-price-cap decision of April 1, 1993, announced in early May 1993.

Strikingly, the price of both portfolios recovers immediately after both events. It might be useful to explore the reasons for this recovery in more detail. However, the pattern is compatible with the following explanation. Following passage of the Act, investors came to believe that the Commission's implementation would not be as severe as they first feared. The Commission's actual proposal in April 1993 was a shock. However, by the end of May it became clear that telephone companies were or could be interested in the acquisition of cable companies, to take advantage of synergies and new product options. While the Commission's rules are intended to establish competitive prices for cable companies (although we understand that issue is under debate), the value of the companies nonetheless rebounded in response to the possibility of a new round of transactions.[21]

We tested this explanation by looking at daily stock price movements for the two portfolios from the end of February to the end of May, 1993, and correlating the daily movement with

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[21] It is not clear just how to treat this rebound, from a regulatory perspective. It appears to bring cable stocks back close to their pre-regulation levels, even with the competitive price benchmarks publicly announced. This could be taken as evidence that the pre-regulation levels represented an undervaluation of the intrinsic value of cable assets, based on a failure to appreciate their potential value to buyers such as U.S. West. If so, the intrinsic competitive market value would be close to actual pre-regulation market value even if that value contained a modest amount (under 10 percent) of capitalized monopoly profits based on information known at the time. In this view, the starting rate base may deserve little or no reduction from pre-regulation market value for capitalized monopoly profits.

news stories in *The New York Times*, *The Wall Street Journal* and the *Cable TV Investor* published by Paul Kagan Associates. These data are depicted in Figure 7. The April 1 news release by the Commission had a clear impact on the value of the portfolios. The premature view that the actual rules were less stringent than expected led to a price rise in early May when the rules were released, followed by a sharp drop the next day as investors fully understood them. However, the Time-Warner, U.S. West deal reached in mid-May sparked a strong rally. Thus, the daily trading data are consistent with the explanation given above.

In this view, the two price drops are measures of the market's view of the impact of regulation. Table 2 reports the falls as a percentage of both equity and total asset value, both with and without adjustment for the predicted movements of the stocks relative to the market in these periods.

	June to October 1992		February to April 1993	
	Value-Weighted Portfolio	Equal-Weighted Portfolio	Value-Weighted Portfolio	Equal-Weighted Portfolio
Equity Losses				
Raw Loss	16.9%	19.1%	20.5%	21.1%
Adjusted Loss	20.4%	22.5%	19.4%	19.9%
Asset Losses				
Raw Loss	7.2%	7.4%	9.0%	8.3%
Adjusted Loss	8.9%	9.0%	8.4%	7.8%

TABLE 2
MARKET-VALUE LOSSES AS PERCENTAGE OF EQUITY AND ASSETS
FOR PORTFOLIOS OF PUBLICLY-TRADED CABLE COMPANIES

The equity values fall by about 20 percent, adjusted for market movements. Of course, the Commission must establish a *total* starting rate base, not merely an *equity* starting rate base. Thus, the Commission requires an estimate of the competitive market value of cable *assets*,

Figure 7
Daily Cumulative Returns of
Cable Service Industry Portfolio
(February 26, 1993 - May 31, 1993)

Equal - Weighted   Value - Weighted
Portfolio   Portfolio
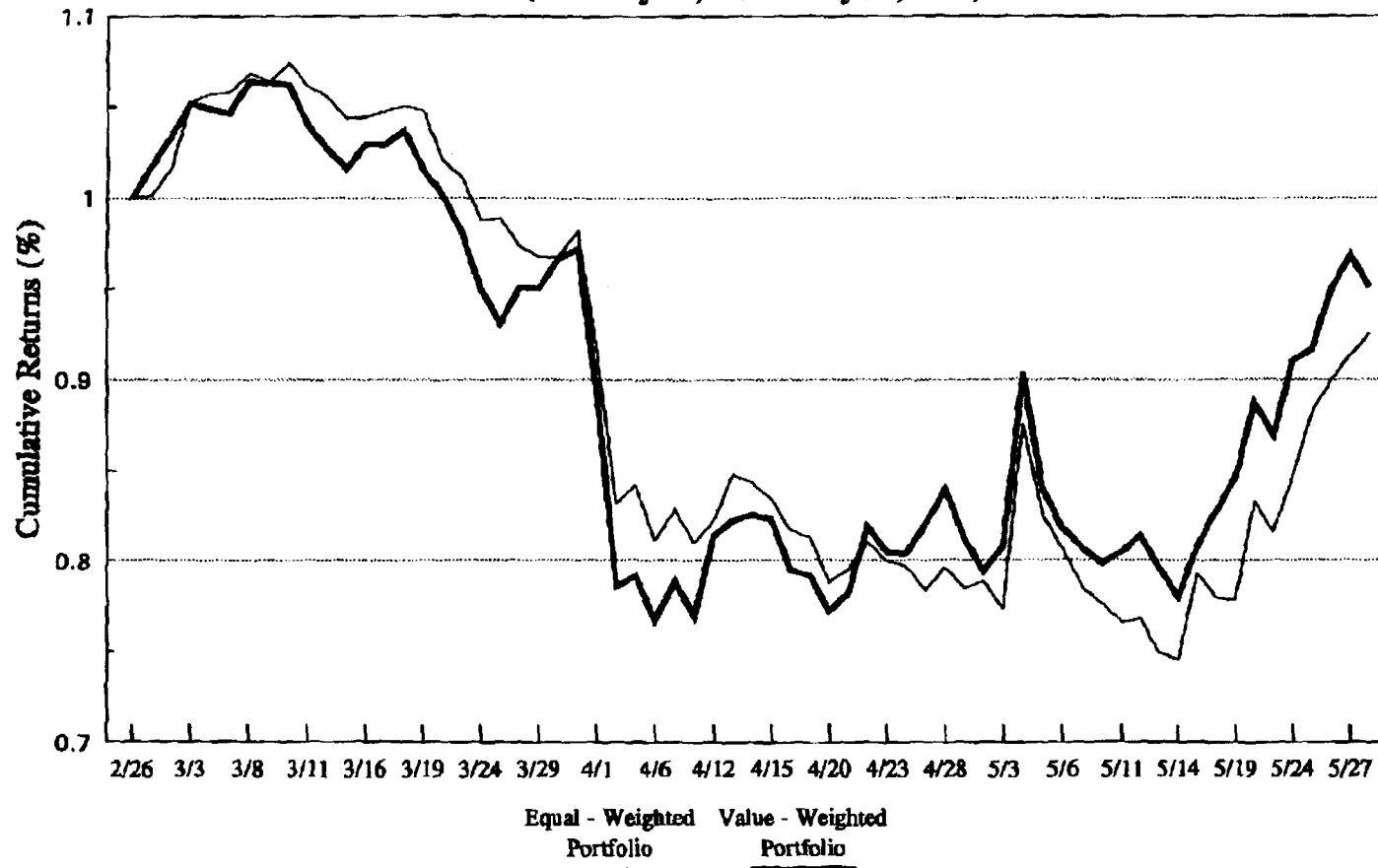
Source: The Brattle Group. Data from Compuserve.

not merely cable *equity*. The percentage loss in the market value of equity times the market equity-to-assets ratio[22] yields the market value loss as a share of asset value. This loss is under 10 percent of pre-regulation market asset value.

These data suggest that if capitalized monopoly profits did exist, and if investors perceive the Commission's price caps to remove them exactly (despite the industry view that they overshoot and go too far), then capitalized monopoly profits are less than 10 percent of the pre-regulation market value of the companies. A policy consistent with this finding would be establishment of a starting rate base equal to *at least* 90 percent of the pre-regulation *market* value of assets.[23]

IV. CONCLUSIONS

Historical book cost has virtually nothing to do with the value of competitive firms, especially in rapidly growing industries. There is no principled economic basis for selection of a starting rate base equal to historical cost. Moreover, given the rapid growth of this industry, a starting rate base equal to net replacement cost would be well below competitive market value, too.

The starting rate base should equal competitive market value. Any shortfall of the starting rate base from competitive market value results in an uncompensated loss to cable investors

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[22] At end-September 1992 stock market prices, the value-weighted portfolio's market equity ratio is a bit over 38 percent, and the equal-weighted portfolio's market equity ratio is a bit under 34 percent. These are adjusted upward for the loss in equity market value to yield market equity ratios as of the June 1992 and February 1993 initial dates.

[23] As noted above in footnote 21, the May 1993 rebound in stock prices may imply that the actual intrinsic competitive market value is nearly equal to the pre-regulation value, even if that value includes a modest amount (under 10 percent) of capitalized monopoly profits based on information known at the time.

equal to that amount. Competitive market value may be difficult to estimate, but there is no choice but to do so if such uncompensated losses are to be avoided.

The response period for the NPRM has been too short to quantify precisely whether competitive market value lies below actual pre-regulation market value, given the data available. However, there is no strong evidence for substantial capitalized monopoly profits. Our study of cable system transactions reveals no evidence of capitalized monopoly profits, but this may be due to the large amount of "noise" in the underlying data. The stock market evidence we have been able to analyze in the time available suggests that capitalized monopoly profits, if they existed, were less than 10 percent of the pre-regulation market value of the assets.

In the future, if the Commission wants a cost-of-service standard that is compatible with its competitive-price standard, it should choose a Trended Original Cost rate base rather than an Original Cost one. This will also reduce "rate shocks" when new investments are made and provide more efficient price signals to cable customers.

APPENDIX A

QUALIFICATIONS OF A. LAWRENCE KOLBE

Lawrence Kolbe is a Principal of The Brattle Group, an economic, management and environmental consulting firm located in Cambridge, Massachusetts. Before co-founding The Brattle Group, he was a Director of Putnam, Hayes & Bartlett, and before that, he was a Vice President of Charles River Associates (CRA). Before joining CRA, he was an Air Force officer assigned to the Office of the Secretary of Defense with the job title "Health Economist," and before that, he was assigned to Headquarters, USAF with the job title "Systems Analyst."

His work has included extensive research in financial economics, especially as it applies to rate regulation, project or asset valuation, and the decisions of regulated firms. Clients for this work include the California Public Utilities Commission, the Consumer Advocate in a Newfoundland proceeding, the Edison Electric Institute, the Electric Power Research Institute, the Newfoundland Federation of Municipalities, the Nova Scotia Board of Commissioners of Public Utilities, the U.S. Department of Energy, the U.S. Department of State, the Town of Labrador City, and a number of private firms, many in rate-regulated industries.

He is the coauthor of two books and has published a number of articles. He is coauthor of a report filed with the British Office of Fair Trading, in London, and he has been an expert witness in proceedings before a commercial arbitration tribunal in Australia, the International Bureau of the Permanent Court of Arbitration in The Hague, the Iran - United States Claims Tribunal in The Hague, U.S. District Courts in Colorado, New Jersey, Oklahoma and Texas, a commercial arbitration tribunal held in London concerning a dispute in Australia, and the Minerals Management Service of the U.S. Department of the Interior; in U.S. federal regulatory proceedings before the Postal Rate Commission, the U.S. Federal Communications Commission, the U.S. Federal Energy Regulatory Commission and the U.S. Federal Maritime Commission; and in state or provincial regulatory proceedings in Alaska, Arkansas, California, Maine, Massachusetts, Michigan, Montana, Newfoundland, Nova Scotia, and Virginia.

He holds a B.S. in International Affairs (Economics) from the U.S. Air Force Academy and a Ph.D. in Economics from the Massachusetts Institute of Technology.

Additional information on his qualifications follows.

HONORS AND AWARDS

Sears Foundation National Merit Scholarship, 1963 (declined).

Fairchild Award, U.S. Air Force Academy, 1968 (for standing first in his class, academically).

HONORS AND AWARDS (continued)

National Science Foundation Graduate Fellowship in economics, MIT, 1968-1971.

Joint Service Commendation Medal, 1975

PROFESSIONAL AFFILIATIONS

American Economic Association

American Finance Association

The Econometric Society

Referee for *The Rand Journal of Economics, Land Economics, The Journal of Industrial Economics*

RECENT PAPERS AND PUBLICATIONS

"The Failure of Competition in the Credit Card Market: Comment" (with Stephen H. Kalos, Carlos Lapuerta and Stewart C. Myers). Working paper in progress.

"How to Value a Lost Opportunity: Measurement of Damages with or without Hindsight" (with William B. Tye and Stephen H. Kalos). Working paper in progress.

"Event Study of the Effects on Pacific Gas & Electric's Debt of the Guarantee of Pacific Gas Transmission's Debt" (with Lynda S. Borucki). *TBG* report prepared for Pacific Gas & Electric Company, May 1993.

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"EPA's 'BEN' Model: A Change for the Better?" (with Kenneth T. Wise and M. Alexis Maniatis), *Toxics Law Reporter* 7, 1125-1129 (February 24, 1993).

"Who Pays for Prudence Risk?" (with William B. Tye), *Public Utilities Fortnightly* (August 1, 1992).

"Types of Risk that Utilities Face," *TBG* report prepared for Niagara Mohawk Power Corporation, May 7, 1992.

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"EPA's 'BEN' Model: Challenging Excessive Penalty Calculations" (with Kenneth T. Wise, Paul R. Ammann and Scott M. DuBoff), *Toxics Law Reporter* 6, 1492-1496 (May 6, 1992).

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"Risk of the Interstate Natural Gas Pipeline Industry" (with Stewart C. Myers and William B. Tye), Washington, DC: Interstate Natural Gas Association of America (October 1991)

"The *Duquesne* Opinion: How Much 'Hope' Is There for Investors in Regulated Firms?" (with William B. Tye). *Yale Journal on Regulation*, Winter 1991.

"How Far Back Should Prudence Tests Reach?" (with William W. Hogan). *Public Utilities Fortnightly* (January 15, 1991).

"Practical Implications of the Supreme Court's *Duquesne* Opinion for Regulated Industries" (with William B. Tye). *Public Utilities Fortnightly* (August 30, 1990).

"Evaluating Demand-Side Options" (with Matthew P. O'Loughlin and Stephen W. Chapel) Palo Alto, CA: Electric Power Research Institute (To appear).

"Financial Constraints and Electric Utility Capital Requirements," (with Matthew P. O'Loughlin) *Proceedings of the 1989 EPRI Utility Strategic Issues Forum.* Palo Alto, CA: Electric Power Research Institute (To appear).

"R&D Project Choice -- Go with the Long Shot" (with Peter A. Morris and Elizabeth Olmstead Teisberg). To appear in *Research - Technology Management.*

"EPRI PRISM Interim Report: Parcel/Message Delivery Services" (with Richard W. Hodges), PHB report prepared for the Electric Power Research Institute, RP-2801-2 (June 1989).

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"Capital Requirements for the U.S. Investor-Owned Electric Utility Industry, 1985-2005" EPRI P-5830. (PHB report with Sarah K. Johnson and Matthew P. O'Loughlin). Palo Alto, CA: Electric Power Research Institute (June 1988).

"Are Regulatory Risks Excessive? A Test of the Modern Balance between Risk and Reward for Electric Utility Shareholders" (PHB report with Matthew P. O'Loughlin). Division of Coal and Electric Policy, U.S. Department of Energy (May 1986).

"Cash Flow Risk, the Cost of Capital, and the Fair Allowed Rate of Return." Working paper in progress.

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"Annual Capital Charges That Will Survive Competition." Prepared for the 11th Annual Rate Symposium, The Institute for Study of Regulation. February 1985.

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"Conditions for Investor and Customer Indifference to Transitions Among Regulatory Treatments of Deferred Income Taxes" (with William B. Tye and Miriam Alexander Baker). *The Rand* (formerly *Bell*) *Journal of Economics* (Fall 1984).

"The Cost of Capital and Investment Strategy" (with Robert A. Lincoln). *Management Review* (May 1984).

"Regulation and Capital Formation in the Oil Pipeline Industry" (with Stewart C. Myers and William B. Tye). *Transportation Journal* (Spring 1984).

"Regulatory Treatment of Deferred Income Taxes Resulting from Accelerated Depreciation by Motor Carriers" (with William B. Tye and Miriam Alexander Baker). *Transportation Journal* (Spring 1984).

RECENT PAPERS AND PUBLICATIONS (continued)

"The Economics of Midstream Switches in Regulatory Treatments of Deferred Income Taxes Resulting from Accelerated Depreciation" (with William B. Tye and Miriam Alexander Baker). *ICC Practitioners' Journal* (November-December 1983).

"Selection of Discount Rates for Project Evaluations." Prepared for the 27th AACE Meeting. June 1983.

"What Rate of Return Makes Your Energy Investment Worthwhile?" (with Robert A. Lincoln). *Power* (April 1983).

"Inflation-Driven Rate Shocks: The Problem and Possible Solutions." *Public Utilities Fortnightly* 111 (17 February 1983).

"Inflation and Utility Finances: Problems and Possible Solutions." Presented at the NARUC Biennial Regulatory Information Conference. September 1982.

"A Model of Capital Market Interactions with Utility Strategic Decisionmaking." Presented at the IMACS World Conference on Systems Simulation and Scientific Computation. August 1982.

"Marginal Cost Pricing with Inflation" (with William R. Hughes). Delivered to the IAEE Conference on International Energy Issues. June 1981.

"The Economics of Revenue Need Standards in Motor Carrier General Increase Proceedings" (with William B. Tye and Miriam Alexander Baker). *Transportation Journal* (Summer 1981).

CRA Reports (Often Written with Others)

"Flow-Through Versus Normalization of Deferred Income Taxes for Motor Carriers" (with William B. Tye and Miriam Alexander Baker). *Motor Freight Controller* (December 1980).

"Evaluating the Effects of Time and Risk on Investment Choices: A Comparison of Finance Theory and Decision Analysis" (with Applied Decision Analysis, Inc.). Published by the Electric Power Research Institute. January 1987.

"The 'Abandonment Value' of Shorter Leadtimes" (with Applied Decision Analysis, Inc.). June 1985.

"Rate Shock and Power Plant Phase-In: Discussion Paper of Generic Issues." Published by the Edison Electric Institute. December 1984.

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CRA Reports (continued)

"Choice of Discount Rates for Utility Planning: A Critique of Conventional Betas as Risk Indicators for Electric Utilities." Published by the Electric Power Research Institute. February 1984.

"Choice of Discount Rates in Utility Planning: An Attempt to Estimate a Multi-Factor Model of the Cost of Equity Capital." December 1983.

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APPENDIX B
IMPLEMENTATION EXAMPLE FOR TRENDED ORIGINAL COST

This appendix describes procedures for calculating the rate base and revenue requirements under a Trended Original Cost ("TOC") approach. The TOC methodology was developed to enable regulated companies to set capital charges[1] that track the time patterns of asset values and earnings in competitive industries subject to inflation. TOC "writes up" asset values to reflect inflation, but sets earnings rates and capital charges in *real* terms, that is, without including any inflation premium in current income. In each year, a real capital charge is based on current asset values and the remaining life of the investment. The real capital charge is updated each year to reflect changes in the underlying value of the assets. Ideally, asset- or industry-specific price indices should be used to trend asset values.[2] However, use of a general inflation index is often a reasonable practice, and these examples assume that is to be done here.

The basic formula for the updating the rate base is:

$$
\begin{array}{ccccc}
\text{Rate Base} & = & \text{Rate Base} & + & \text{Rate Base} & - & \text{Rate Base} \\
\text{End of Year} & & \text{Beginning of Year} & & \text{Write-Up} & & \text{Depreciation}
\end{array}
$$

The rate base in the first year is equal to the investment cost (or the starting rate base for investments in place when regulation began). This number is then multiplied by the percentage change in the inflation index to get the "write-up" for that year. This write-up reflects the increase in the value of the asset.

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[1]   Capital charges under the usual definition of the regulatory weighted-average cost of capital -- the average of the after-tax cost of equity and the before-tax cost of debt -- equal after-tax income plus total interest expense.

[2]   If this is done, the real rate of return should be adjusted by any *expected* difference between industry-specific and general inflation, so the overall return return is *expected* to equal the nominal cost of capital.

An example of the TOC rate base is given in Table B-1. It assumes a starting rate base of $100,000. While TOC can accommodate any depreciation schedule, the example assumes straight-line depreciation is used. In this case, the amount of depreciation is equal to that year's undepreciated rate base[3] times a fraction equal to one divided by the expected life of the asset.[4] Thus, if we assume an average life of 20 years, depreciation each year is 5 percent of the undepreciated rate base.

The next year's rate base equals the previous year's rate base plus new acquisitions and minus retired assets. The adjustments are made both to the total rate base and to the amount of depreciation carried forward into the next year. However, in these examples, we assume there are no acquisitions or retirements.

Table B-2 derives the revenue requirement under TOC. The standard cost-of-service relationship is used:

REVENUE = EXPENSES + EARNINGS

Here, earnings is the sum of after-tax net income plus interest expense, while taxes and depreciation are part of expenses.[5] Under TOC regulation, each regulated company is allowed a current return on the rate base equal to the real overall cost of capital times the

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[3] The undepreciated rate base under TOC regulation is equal to the original rate base value times the ratio of the cumulative inflation index in the current year to the index value in the original year. For new assets, the "original" year is the year they are purchased. For investments in the starting rate base, the original year is the "as of" date of the starting rate base.

[4] A non-straight-line depreciation schedule would simply perform the same calculation using the depreciation fraction appropriate for the year in question.

[5] In this example, operating expenses are set to 10 percent of the starting rate base and grow each year at the rate of inflation. Taxes are calculated at a 40 percent combined state and federal rate. Interest expense assumes an initial debt ratio of 60 percent at a 10 percent interest rate, amortized at the straight-line depreciation rate. The overall real rate of return is set at 12 percent. Working capital is set at two months' operating expenses.

sum of the rate base and an allowance for working capital. Correctly implemented, the TOC method generates an *overall* expected rate of return (current earnings plus asset write-up) equal to the rate base times the nominal cost of capital, which is the rate of return investors demand *on average* from investments that are just as risky as the investment at hand.

The revenue requirement merely adds up the costs. Taxes are calculated at the statutory rate, and book depreciation is assumed to be straight-line, also. The difference between rate base and book depreciation is taxable.

Table B-1
Example of Trended Original Cost: Rate Base

Year	1993	1994	1995	1996	1997	1998	1999	2000
1. Calculate Write-Up								
Rate Base, beginning of year	$100,000	$98,800	$97,999	$96,257	$93,675	$90,982	$88,313	$84,957
x Inflation Rate*	4.0%	4.7%	4.0%	3.4%	3.6%	4.0%	3.6%	4.1%
= Write-Up	$4,000	$4,644	$3,920	$3,273	$3,372	$3,639	$3,179	$3,483
2. Calculate Rate Base Depreciation								
Starting Rate Base	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
x Cumulative Inflation	104.0%	108.9%	113.2%	117.1%	121.3%	126.2%	130.7%	136.1%
= Undepreciated Rate Base	$104,000	$108,888	$113,244	$117,094	$121,309	$126,162	$130,703	$136,062
x Depreciation Rate	5%	5%	5%	5%	5%	5%	5%	5%
= Rate Base Depreciation	$5,200	$5,444	$5,662	$5,855	$6,065	$6,308	$6,535	$6,803
3. Calculate Rate Base, End of Year								
Rate Base, beginning of year	$100,000	$98,800	$97,999	$96,257	$93,675	$90,982	$88,313	$84,957
+ Write-Up	$4,000	$4,644	$3,920	$3,273	$3,372	$3,639	$3,179	$3,483
− Rate Base Depreciation	($5,200)	($5,444)	($5,662)	($5,855)	($6,065)	($6,308)	($6,535)	($6,803)
= Rate Base, End of Year	$98,800	$97,999	$96,257	$93,675	$90,982	$88,313	$84,957	$81,637

*Inflation rate in this example is a random variable centered on 4 percent annually.

Table B-2
Example of Trended Original Cost: Revenue Requirement

Year	1993	1994	1995	1996	1997	1998	1999	2000
Revenue Requirement Determination								
Rate Base	$100,000	$98,800	$97,999	$96,257	$93,675	$90,982	$88,313	$84,957
+ Working Capital	$1,667	$1,733	$1,815	$1,887	$1,952	$2,022	$2,103	$2,178
= Rate Base + Working Capital	$101,667	$100,533	$99,814	$98,144	$95,627	$93,004	$90,416	$87,136
x Rate of Return	12%	12%	12%	12%	12%	12%	12%	12%
= Current Earnings	$12,200	$12,064	$11,978	$11,777	$11,475	$11,160	$10,850	$10,456
+ Rate Base Depreciation	$5,200	$5,444	$5,662	$5,855	$6,065	$6,308	$6,535	$6,803
+ Taxes	$4,267	$4,539	$4,827	$5,021	$5,160	$5,312	$5,457	$5,573
+ Operating Expenses	$10,000	$10,400	$10,889	$11,324	$11,709	$12,131	$12,616	$13,070
= Revenue Requirement	$31,667	$32,447	$33,355	$33,978	$34,410	$34,912	$35,458	$35,903
Taxes Worksheet								
Current Earnings	$12,200	$12,064	$11,978	$11,777	$11,475	$11,160	$10,850	$10,456
+ Rate Base Depreciation	$5,200	$5,444	$5,662	$5,855	$6,065	$6,308	$6,535	$6,803
− Book Depreciation	($5,000)	($5,000)	($5,000)	($5,000)	($5,000)	($5,000)	($5,000)	($5,000)
− Interest Expense*	($6,000)	($5,700)	($5,400)	($5,100)	($4,800)	($4,500)	($4,200)	($3,900)
= After−tax Book Income	$6,400	$6,808	$7,240	$7,532	$7,741	$7,969	$8,185	$8,359
/ (1−tax rate)	60%	60%	60%	60%	60%	60%	60%	60%
= Pre−tax Book Income	$10,667	$11,347	$12,066	$12,553	$12,901	$13,281	$13,642	$13,932
− After−tax Book Income	($6,400)	($6,808)	($7,240)	($7,532)	($7,741)	($7,969)	($8,185)	($8,359)
= Taxes	$4,267	$4,539	$4,827	$5,021	$5,160	$5,312	$5,457	$5,573

*Interest expense assumes 60 percent initial debt financing at 10 percent interest, amortized at straight−line depreciation rate.